

**PIT Tagging of Juvenile Salmon Smolts in the Lake Washington Basin:  
Year 2000 Pilot Study Results**

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**Report Prepared For**

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**Abstract**

This study evaluates the feasibility of using Passive Integrated Transponder (PIT) tag technology to monitor smolt migration and survival characteristics as they pass through the Lake Washington Ship Canal (LWSC) system, including the Hiram M. Chittenden Locks. Four smolt flumes and PIT tag detection devices (tunnel readers) were installed over the spillway dam of the Locks to monitor outmigration during the spring of 2000. Hatchery chinook salmon juveniles were tagged and released at two locations in the LWSC, and chinook juveniles captured in screw traps were tagged and released in the lower reaches of the Cedar River, Bear Creek, and Issaquah Creek. Chinook, sockeye, and coho salmon juveniles were also captured, tagged, and released in Lake Union. Calibration tests were performed using tagged hatchery chinook juveniles to evaluate the detection efficiency of the tunnel readers. Sampling was also conducted for PIT tagged fish by purse seining in the large lock and by beach seining in saltwater areas below the Locks. Despite problems encountered with a disease outbreak in the LWSC, structural features of the flume supports depressing the detection efficiency of the tunnel readers, and absence of complete coverage of PIT tagged fish passing the Locks through other routes, the data collected provided valuable biological information on migration, passage, and estuarine behavior of smolts leaving the Lake Washington system for adult life in saltwater. The data also provided first order survival estimates for different portions of the migration route. Study implications and improvements are suggested.

## **PURSE SEINE SAMPLING IN LARGE LOCK:**

- ! \$3 out of 14 PIT-tagged fish captured were recycling through large lock (- 20%; vs. - 3% detected 2x at flumes)

## **BEACH SEINE SAMPLING BELOW LOCKS:**

- ! 21 PIT-tagged fish captured
- ! Out of 16 identifiable tags:
  - < 7 were calibration test fish released through flumes
  - < 1 from UW (Montlake) releases
  - < 4 from Lake Union (Fremont Bridge) releases
  - < 4 from Metro Lab releases

## **SUMMARY OF 2000 PILOT STUDY RESULTS (preliminary):**

- ! Relative differences in survival (i) from tributaries to Montlake, (ii) in the Ship Canal, and (iii) past Ballard Locks
- ! Juvenile Passage Behavior:
  - < More smolts passed through flumes located closer to fish ladder
  - < Most (>90%) chinook passed during daylight hours; passage pattern more pronounced after mid-June
  - < All sockeye passed during daylight hours
  - < Coho passage relatively uniform over 24-hour period

## ! Juvenile Chinook Migration:

- < Larger fish caught in Lake Union emigrated past Locks sooner than smaller fish from tributary and Montlake/Metro Lab releases
- < Fish released at Montlake and Metro Lab arrived at Locks in small, steady numbers, until last week in June when passage numbers increased substantially
- < Tagged tributary fish arrived beginning second week in June and most passed by beginning of July
- < Arrival date at Locks (i) generally independent of release date or flow in Ship Canal (ii) indicated a strong behavioral influence related to time of year and smolt readiness
- < Most fish passing through Ship Canal moved  $\approx 0.3$  mi/day;

Tributary fish moved ~0.5-1.5 mi/day on average on way to Locks, taking between 20-40 days

! Juvenile Sockeye and Coho Migration:

- < Sockeye actively emigrated in mid- to late May
- < Most (~90%) sockeye took 3 days or less to travel from Fremont Bridge to Ballard Locks (~2.7 miles)
- < Coho emigration timing was intermediate between sockeye and chinook timing
- < ~50% of coho took 3 days or less to travel from Fremont Bridge to Ballard Locks; ~90% took 15 days or less.

! Passage at Ballard Locks/Estuarine Transition:

- < 32 chinook passed through flumes twice Y Recycling through locks
- < Recycling time greatest at beginning of experiment (up to 40 days between detection), decreased with time until last two weeks in June when recycling time was 5 days or less
- < No relation between recycling time and fish size at time of tagging

- < Large fraction of tagged fish caught in beach seine sampling below Locks made transition to saltwater ( $20^E/_{EE}$ ) in less than 2 days (>